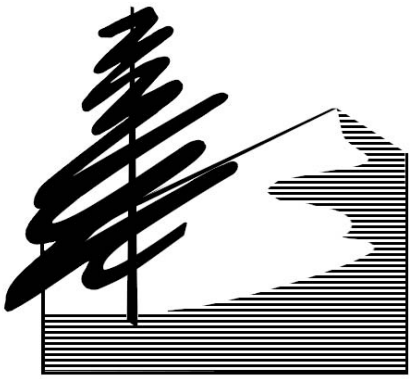
Carlsbad Oaks North
Habitat Conservation Area
(S034)

Annual Work Plan
October 2007 - September 2008

Prepared for:
U.S. Fish and Wildlife Service
California Department of Fish and Game
City of Carlsbad
County of San Diego

Prepared by:



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October 19, 2007

Table of Contents

I. INTRODUCTION AND SUMMARY

This work plan has been developed from the guidelines for goals and objectives set forth in the City of Carlsbad Preserve Management Plan (PMP) for the Carlsbad Oaks North Habitat Conservation Area (HCA) dated January 2005 (Tierra Data 2005) and as approved by the United States Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG). This annual work plan also includes additional management activities that the Center for Natural Lands Management (CNLM or Center) feels are appropriate to protect and maintain the natural resources at the HCA in perpetuity.

The HCA covers 326 acres, of which 108.4 acres are located within a conservation easement (CE) on lands owned by the County of San Diego. The CE was transferred to the Center in November of 2005. The Center received funds to manage the CE portion in May of 2006 at which time management activities commenced. The Center received fee title for the remaining 219.6 acres from the previous owner, Techbilt Construction Corporation (Techbilt), in March of 2007 at which time we also received all funding for preserve management.

The purpose of this work plan is to identify the tasks and budget required to complete the management activities for the upcoming management year that will begin on October 1, 2007 and end on September 30, 2008. This is the second annual work plan submitted for this HCA since receiving the original CE portion in May 2006. The scope of this work plan is similar to last year's despite the additional acreage added to our management in March 2007 (CNLM 2006), since the management issues are common to both properties. Unless otherwise stated, all tasks will be performed by the Center's Area Manager, Markus Spiegelberg, and Center Preserve Managers Patrick McConnell and Jessica Vinje.

Summary of Tasks and Goals for the 2007-2008 Management year:

- Install and maintain existing signs and fences
- Map all sensitive wildlife species observed
- Continue census and mapping efforts for the San Diego thornmint (*Acanthomintha ilicifolia*), thread-leaved brodiaea (*Brodiaea filifolia*), summer holly (*Comarostaphylis diversifolia*), and Nuttall's scrub oak (*Quercus dumosa*)
- Conduct habitat assessments of thread-leaved brodiaea, and San Diego thornmint
- Conduct focused surveys for Coastal California gnatcatcher (*Polioptila californica californica*), record and map observations of other sensitive avian species
- Map occurrences and/or signs of orange-throated whiptail *(Cnemidophorus hyperythrus*) and San Diego horned lizard (*Phrynosoma coronatum blainville*)
- Set up and conduct coastal sage scrub (CSS) long-term monitoring plots
- Track wildlife movement using wildlife cameras
- Monitor and control nonnative, exotic plants in coordination with Techbilt, the developer of the Carlsbad Oaks North business park

- Control non-native hollow-stem asphodel (*Asphodelus fistulosus*) and rosemary (*Limmonium* spp.)
- Correct erosion control issues as needed along unwanted trails
- Rehabilitate unwanted trails using native plants
- Develop a public outreach brochure that outlines the duties of the Center at the HCA and notifies neighbors of the changes of ownership
- Conduct weekly patrol visits
- Remove trash as necessary
- Prepare and provide to the wildlife agencies an annual report that describes the management activities and information gathered during the management year
- Provide an accounting of funds to be spent in the management year

Appendix 1 (*2007-2008 Task Schedule*) identifies the approximate schedule of tasks for the upcoming management year. Appendix 2 (*Annual Budget 2007-2008*) provides a financial summary for both staff time and costs for the year. The location of the HCA is shown in Appendix 3.

II. MANAGEMENT ACTIVITIES

The following sections identify and describe the activities to be performed during the upcoming management year. Based upon the Property Analysis Record (PAR), developed by the Center to outline long-term management tasks and costs, management activities for the HCA can be categorized into seven groups: Capital Improvements, Biological Surveys, Habitat Restoration and Maintenance, Public Services, Reporting, Office Maintenance, and Operations. Each of these categories will be discussed below.

A. CAPITAL IMPROVEMENTS

The installation of signs and fences will occur during this management year:

1. Signing Signs will be maintained at all of the major access points and along most of the perimeter to the HCA, and a few other needed locations. Some areas bordering the HCA are still under construction by Techbilt, and thus will need signage or additional fencing as various projects near completion. Each sign explains that the HCA is dedicated as a habitat conservation area, and that fire, mechanized travel, dumping and shooting are prohibited.

2. Fencing We will install smooth-wire fencing wherever necessary to dissuade trail users from ranging outside of allowable trails, and to keep them from trampling areas being re-vegetated. Several illegal trails will be closed to further access in the center of the HCA, as will any access points from the northeastern side of the HCA. The Center will install smooth-wire fencing along redundant, illegal trails and in areas where homeless encampments continue to recur. As build-out continues in the center-east of the HCA, we will look for problem spots, or new entry points created by mountain bikers, and close these off when they appear. We will continue to maintain existing fencing, and make repairs to vandalized fencing when necessary.

B. BIOLOGICAL SURVEYS

Biological monitoring activities at the HCA will follow items listed in the PMP. The Center has modified monitoring tasks outlined in the PMP to adjust the task time lines and some of the tasks which it finds to be unnecessary at this time. Below is a description of the tasks that will be accomplished during the upcoming management year. In addition, Table 1 outlines all tasks that will be completed at the HCA and an associated time line for the next 5 years.

Monitoring during the next year includes focused surveys for coastal California gnatcatcher, census and mapping of sensitive plants, habitat assessments for two of these sensitive species, and includes the first year of a long-term CSS monitoring program. Other sensitive plant and animal species will be mapped and counted when noted. All data will be entered or stored in a Geographic Information System (GIS) database. A brief description of monitoring activities outlined by taxa is provided below:

1. Animal Use Monitoring

a. California Gnatcatcher & Avifauna Monitoring We will conduct two to three focused surveys for coastal California gnatcatchers during the spring months and note other sensitive bird species.

b. Small and Large Mammal Monitoring Sensitive mammals, such as southern muledeer (*Odocoileus hemionus*) and San Diego black-tailed jackrabbit (*Lepus californicus bennettii*) will be mapped when they are observed. In addition, wildlife tracking cameras will continue to be installed in several locations to determine which species use the HCA and where corridors for these species exist.

c. Amphibian and Reptile Monitoring Sensitive amphibians or reptiles, such as orange-throated whiptail *(Cnemidophorus hyperythrus*) and San Diego horned lizard (*Phrynosoma coronatum blainville*) will be mapped when they are observed. Focused surveys are not budgeted for the 2007-2008 management year, but will likely be budgeted for 2008-2009 management year.

2. Vegetation Sampling and Habitat Assessments

a. CSS long-term monitoring Several long term vegetation monitoring plots will be installed throughout the HCA as part of our objective to track changes in species cover, presence, and population attributes over time. More information about the justification for these plots and the sampling design is provided in Appendix 4.

Table 1
Schedule of Biological Monitoring Tasks

	Management Year				
Monitoring task	**2007/2008**	**2009/2010**	**2010/2011**	**2011/2012**	**2012/2013**
Focused sensitive reptile surveys[1]		X			X
Coastal California gnatcatcher surveys (including observations of other sensitive avian species)	X	X	TBD	TBD	TBD
Avifauna point counts[2]	TBD	TBD	TBD	TBD	TBD
Wildlife tracking	X	X	X	X	
CSS vegetation data collection[3]	X			X	
Thread-leaved brodiaea and San Diego thornmint surveys (including assessment of habitat)	X	X	X	X	X
Summer holly and Nuttall's scrub oak[4]	X			X	X
Other sensitive plant surveys	X			X	

1. Focused reptile surveys will occur in lieu of installing and monitoring pitfall arrays. Pitfall arrays will not be installed since the HCA is heavily used by the public. In the experience of the Center, these arrays would be vandalized. Incidental observations of individuals or signs (scat, tracks) will be mapped.

2. The management plan specifies that avian point counts should occur annually. The actual time line for annual point counts will be determined in the future.

3. The Center will initiate coastal sage scrub quantitative monitoring during the 2007-2008 management year. Coastal sage scrub quantitative monitoring will occur every 3 years.

4. Census and mapping was partially completed in the summer of 2007. We will finish the initial effort during fall or summer of 2007-8.

b. San Diego thornmint and thread-leaved brodiaea habitat assessments An initial assessment of thread-leaved brodiaea habitat and population census will take place in the spring of 2008. The Center will also continue with the second year of San Diego thornmint habitat assessment and censusing during the spring of 2008. Direct counts of both species will take place, and estimates of vegetative cover by species will be taken at all sites where the species are found. For details on the rationale and methodology for

conducting the San Diego thornmint assessments, see the 2006-2007 Annual Report for this HCA. The methodology for conducting thread-leaved brodiaea habitat assessments will be similar to that done for San Diego Thornmint, but hasn't yet been devised.

3. Sensitive Plant Monitoring

Nutall's scrub oak and summer holly mapping Hundreds of individuals of each species were censused and mapped in the summer of 2007. This initial effort will conclude in the late fall or early summer of 2007 or 2008. For preliminary results, refer to the 2006-2007 Annual Report for this HCA. With further information about location and population numbers, subsequent vegetation assessments can be designed which can inform management activities.

Some sensitive plant species in addition to those already listed will be censused and mapped where found throughout the HCA in spring 2008. These include previously found species such as San Diego goldenstar (*Muilla clevelandii*), small flowered morning glory (*Convolvulus simulans*), Palmer's grapplinghook (*Harpagonella palmeri*), and small flowered microseris (*Microseris douglasii* var. *platycarpha*). With further information about location and population numbers, subsequent vegetation assessments can be designed which can inform management activities. Some sensitive perennials known to occur in the HCA such as spineshrub (*Adolphia californica*), western dichondra (*Dichondra occidentalis*), and San Diego sagewort (*Artemisia palmeri*) may be budgeted for mapping and censusing in future years.

C. HABITAT RESTORATION AND MAINTENANCE

Most of the HCA habitat is good quality, with little disturbance from nonnative species. There are nonnative exotic plants scattered throughout the HCA, however. The Center has budgeted for continuing the eradication efforts in Village H.

1. Nonnative Plants

As per the wildlife agency permits for the Carlsbad Oaks North development and per the agreements between Techbilt and the Center, Techbilt is responsible for the removal and maintenance of all "zero" tolerance nonnative plant species within the approved habitat restoration projects (five-year maintenance period) and the rest of the HCA (three-year maintenance period). After three years, the Center will take responsibility of weed removal in the HCA. The Center will continue to monitor and coordinate removal of nonnative exotics in the HCA with Techbilt when they are located.

Several weeds that were not noticed on the HCA prior to written agreements with Techbilt have since been located. Among these are hollow-stem asphodel and rosemary. The Center has budgeted for, and will contract treatment of these weeds during the spring of 2008.

2. Illegal Trail Rehabilitation The Center plans to rehabilitate several former high-use mountain bike trails in the west-central portion of the HCA. Trail rehabilitation on the County CE areas (i.e., trail leading from Police Station to valley) took place during the winter of 2006. With the second phase of construction along the central eastern portion of the HCA, connectivity to mountain bike trails has largely been lost, and thus the use of trails has dropped substantially. A few of these trails, however, are experiencing some erosion and could benefit from management. The Center has budgeted for the installation of 100 native plants along sections in need of re-vegetation during the winter of 2008. Center personnel will also install cactus pads (*Opuntia littoralis*) along the trail in an effort to permanently block access and speed the re-vegetation process.

The Center also worked on shoring up problem sections of the "skyline" trail during the summer of 2007. We have budgeted for more work in this area in case heavy winter rains cause further erosion or soil displacement.

D. PUBLIC SERVICES

Public service activities include the patrolling of the HCA, consulting with neighbors about perimeter landscaping, and responding to emergencies. However, other opportunities for public service may be forthcoming during the year with local groups and individuals interested in volunteering labor for HCA projects, and class field trips from local schools. Whenever possible, HCA management will try to accommodate these activities.

1. Patrolling Patrols will be performed approximately four times per month, and during biological surveys or other HCA activities. The main patrol activities will be to ensure that the public does not use any of the illegal trails located on the HCA until all construction is completed. Routine fence and sign repair and replacement will be main tasks during the upcoming management year. Also during patrols, observations of sensitive animal species, new human impacts, and new weed infestations will be documented, and trash will be collected.

2. Public Outreach The Center will prepare a brief report explaining its duties at the HCA and provide this report to adjacent Home and Commercial Owners Associations and local businesses.

3. Emergency Response Staff time has been allocated from the current budget for response to emergencies on the HCA. Such emergencies could include response to wildfires, wildlife problems reported by neighbors, and trespass.

E. REPORTING

Reporting requirements include the management of the HCA's database/GIS system, the photo-documentation stations, and the production of various status reports to the City of Carlsbad USFWS, CDFG and Center administration.

1. Database/GIS Management Data derived from routine patrols and photo-documentation will be entered into and maintained in the HCA's existing database/GIS system. Additional databases will be established for the various biotic monitoring programs including the production of historical and current vegetation maps. Efforts will be made to coordinate and standardize database fields and parameters with other reserves. This task will be accomplished by a subcontractor, Cadre Environmental. This company will standardize all of the HCA GIS files/databases with all of the other Center GIS files/databases.

2. Photo-documentation Stations Permanent photo-documentation stations were established in 2006 and photographs were taken, labelled and stored. These photographs will be updated in 2009.

2. Reports

a. Year-End/Agency Reports An annual report will be prepared by the HCA manager by December 2008 detailing the results of the year's management activities. This report will include recommendations for the continuation of various activities for the following management year and will be submitted to the County of San Diego, City of Carlsbad, USFWS, and CDFG as required under permit reporting conditions.

b. Annual Work Plan The annual work plan for the 2008-2009 management year will be formulated by the end of the 2007-2008 management year and will be based upon experiences during previous years' operations. This work plan will be submitted to the City of Carlsbad, USFWS and CDFG.

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F. OFFICE MAINTENANCE

HCA management will maintain offices in an organized manner to facilitate maximum efficiency. This section of the budget includes outlays for general office work, utilities, and telephones, among other items and tasks.

G. OPERATIONS

Operations include the training and professional growth of Center personnel, and inspection of the HCA by Center administration. Funds have been allocated in the current budget for the HCA Managers to attend classes or seminars during the 2007-2008 year. Also included within this category of activity is the conduct of employee reviews.

III. WORKLOAD AND BUDGETS

1. Supervision and Staffing: The Area Manger will be supervised by CNLM's Director of Conservation Science (DCS), Deborah Rogers. Tasks and hours will be coordinated by the Area Manager and approved by the DCS. The Area Manager, Markus Spiegelberg will supervise the Preserve Managers, Jessica Vinje and Patrick McConnell.

2. Budgeting: A budget of $43,933 has been prepared and approved for this fiscal year and is included here as Appendix 2. Every effort will be made by Preserve Management to allocate time and expenses according to this estimated budget.

IV. REFERENCES

CNLM. 2006. Carlsbad Oaks Habitat Conservation Area (S034) Annual Work Plan 2006-2007. December 2006.

Tierra Data. 2005. City of Carlsbad Preserve Management Plan for the Carlsbad Oaks North Habitat Conservation Area. January 2005.

IV. APPENDICES

Appendix 1
2007-2008 Task Schedule

Task	October to December 2007	January to March 2008	March to June 2008	July to September 2008
Coordinate Nonnative Plant Removal	X	X	X	X
Coastal California Gnatcatcher Surveys		X	X	
Sensitive Plant Surveys (and habitat assessments)		X	X	X
Wildlife Movement and Observations Mapping	X	X	X	X
CSS Monitoring			X	
GIS/Database			X	
Trail Rehabilitation	X	X		
Fencing/Signage	X	X	X	X
Patrolling	X	X	X	X
Reports				X
Public Outreach			X	X

Appendix 2
Annual Budget

Section 8 - Initial & Capital Tasks and Costs

Property Title: Carlsbad Oaks North | Dataset: CA005 | PAR ID: S034V08 | 10/16/2007

Budget: Annual Budget 2007-8

Task list	Specificaton	Unit	Number of Units	Cost / Unit	Annual Cost	Times Years	Total Cost
SITE CONSTRUCTION/MAINT.							
Fence - Installed	Smooth-wire, 3 strd.	Roll	1.00	25.00	25.00	1.0	25.00
Fence	Fencing instal., trails PM	L. Hours	12.00	27.32	327.84	1.0	327.84
Fence	Fencing instal., trails JV	L. Hours	8.00	32.48	259.84	1.0	259.84
Fence	T-posts	Item	40.00	3.00	120.00	1.0	120.00
Lock	Padlock	Item	4.00	20.25	81.00	1.0	81.00
Sub-Total							813.68
BIOTIC SURVEYS							
Project Management	Supervise/coordinate MS	L. Hours	8.00	40.55	324.40	1.0	324.40
Plant Ecologist	Sensitive plnt surveys PM	L. Hours	32.00	27.32	874.24	1.0	874.24
Plant Ecologist	Thornmint/Brodiaea trend PM	L. Hours	12.00	27.32	327.84	1.0	327.84
Plant Ecologist	Long-term veg monitoring PM	L. Hours	24.00	27.32	655.68	1.0	655.68
Plant Ecologist	Long-term veg monitoring JV	L. Hours	16.00	32.48	519.68	1.0	519.68
Plant Ecologist	Long-term veg monitoring MS	L. Hours	8.00	40.55	324.40	1.0	324.40
Mammalogist	Wildlife camara tracking PM	L. Hours	16.00	27.32	437.12	1.0	437.12
Ornithologist	CAGN/sens species MS	L. Hours	18.00	40.55	729.90	1.0	729.90
Science Director	Planning and Review	L. Hours	15.00	50.00	750.00	1.0	750.00
Sub-Total							4,943.26
HABITAT RESTORATION							
Project Management	Plant Install PM	L. Hours	16.00	27.32	437.12	1.0	437.12
Project Management	Plant Install JV	L. Hours	16.00	32.48	519.68	1.0	519.68
Project Management	Plant Install MS	L. Hours	8.00	40.55	324.40	1.0	324.40
Plant Procurement	Trees, shrubs	Dee Pot	100.00	2.00	200.00	1.0	200.00
Revegetation	Plant Installation RECON	C. Hours	40.00	32.00	1,280.00	1.0	1,280.00
Sub-Total							2,761.20
HABITAT MAINTENANCE							
Exotic Plant Control	RECON Asphodel and other	C. Hours	80.00	32.00	2,560.00	1.0	2,560.00
Exotic Plant Control	Control and coord. PM	L. Hours	48.00	27.32	1,311.36	1.0	1,311.36
Exotic Plant Control	Herbicide 41% con.	2 Gal.	3.00	159.90	479.70	1.0	479.70
Sub-Total							4,351.06
PUBLIC SERVICES							
Access Control	Patrol,mend fence,trash PM	L. Hours	80.00	27.32	2,185.60	1.0	2,185.60
Access Control	Patrol,mend fence,trash MS	L. Hours	24.00	40.55	973.20	1.0	973.20
Trail	Maintenance PM	L. Hours	16.00	27.32	437.12	1.0	437.12
Trail	Maintenance JV	L. Hours	16.00	32.48	519.68	1.0	519.68
Community Outreach	Outreach PM	L. Hours	16.00	27.32	437.12	1.0	437.12
Sub-Total							4,552.72

Task list	Specificaton	Unit	Number of Units	Cost / Unit	Annual Cost	Times Years	Total Cost
REPORTING							
Database Management	Data Input and analyses PM	L. Hours	16.00	27.32	437.12	1.0	437.12
GIS/CAD Management	Data Management MS	L. Hours	8.00	40.55	324.40	1.0	324.40
Annual Work Plan	Plan and PAR Budget MS	L. Hours	4.00	40.55	162.20	1.0	162.20
Annual Work Plan	Plan and PAR Budget PM	L. Hours	8.00	27.32	218.56	1.0	218.56
Agency Report	Annual Report MS	L. Hours	16.00	40.55	648.80	1.0	648.80
Agency Report	Annual Report PM	L. Hours	24.00	27.32	655.68	1.0	655.68
Sub-Total							2,446.76
OFFICE MAINTENANCE							
Administrative	Operations MS	L. Hours	32.00	40.55	1,297.60	1.0	1,297.60
Administrative	Operations JV	L. Hours	10.00	32.48	324.80	1.0	324.80
Administrative	Operations PM	L. Hours	30.00	27.32	819.60	1.0	819.60
Preserve Office	Rent	Year	0.10	5,115.00	511.50	1.0	511.50
Telephone Charges, Annual	Phone Charges	Year	0.10	3,300.00	330.00	1.0	330.00
Office Supplies, Year	Stationery/envelopes	Person	0.10	2,500.00	250.00	1.0	250.00
Computer, PC & Monitor	Computer, and peripheral	Item	0.13	2,000.00	260.00	1.0	260.00
Laser Printer	Printer	Item	0.30	639.60	191.88	1.0	191.88
Sub-Total							3,985.38
FIELD EQUIPMENT							
Vehicle	Mileage	Mile	3,800.00	1.18	4,484.00	1.0	4,484.00
Camera 35mm/lens	Wildlife camera	Item	1.00	400.00	400.00	1.0	400.00
Other	Data collection device	Item	1.00	300.00	300.00	1.0	300.00
Sub-Total							5,184.00
OPERATIONS							
Audit	CPA Audit	Item	0.10	3,043.00	304.30	1.0	304.30
Insurance	General	Item	1.00	421.37	421.37	1.0	421.37
Employee Training	Retreat expense	Day	0.10	1,485.00	148.50	1.0	148.50
Conferences	Conferences	Day	0.10	500.00	50.00	1.0	50.00
Other	Vacation, holiday, retreat MS	L. Hours	24.00	40.55	973.20	1.0	973.20
Other	Vacation, holiday, retreat JV	L. Hours	23.00	32.48	747.04	1.0	747.04
Other	Vacation, holiday, retreat PM	L. Hours	20.00	27.32	546.40	1.0	546.40
Other	Bio One	Item	0.10	245.00	24.50	1.0	24.50
Sub-Total							3,215.31
CONTINGENCY & ADMINISTRATION							
Contingency							3,225.34
Administration							8,514.89
Sub-Total							11,740.23
Total							43,993.60

Appendix 3
HCA Location Maps

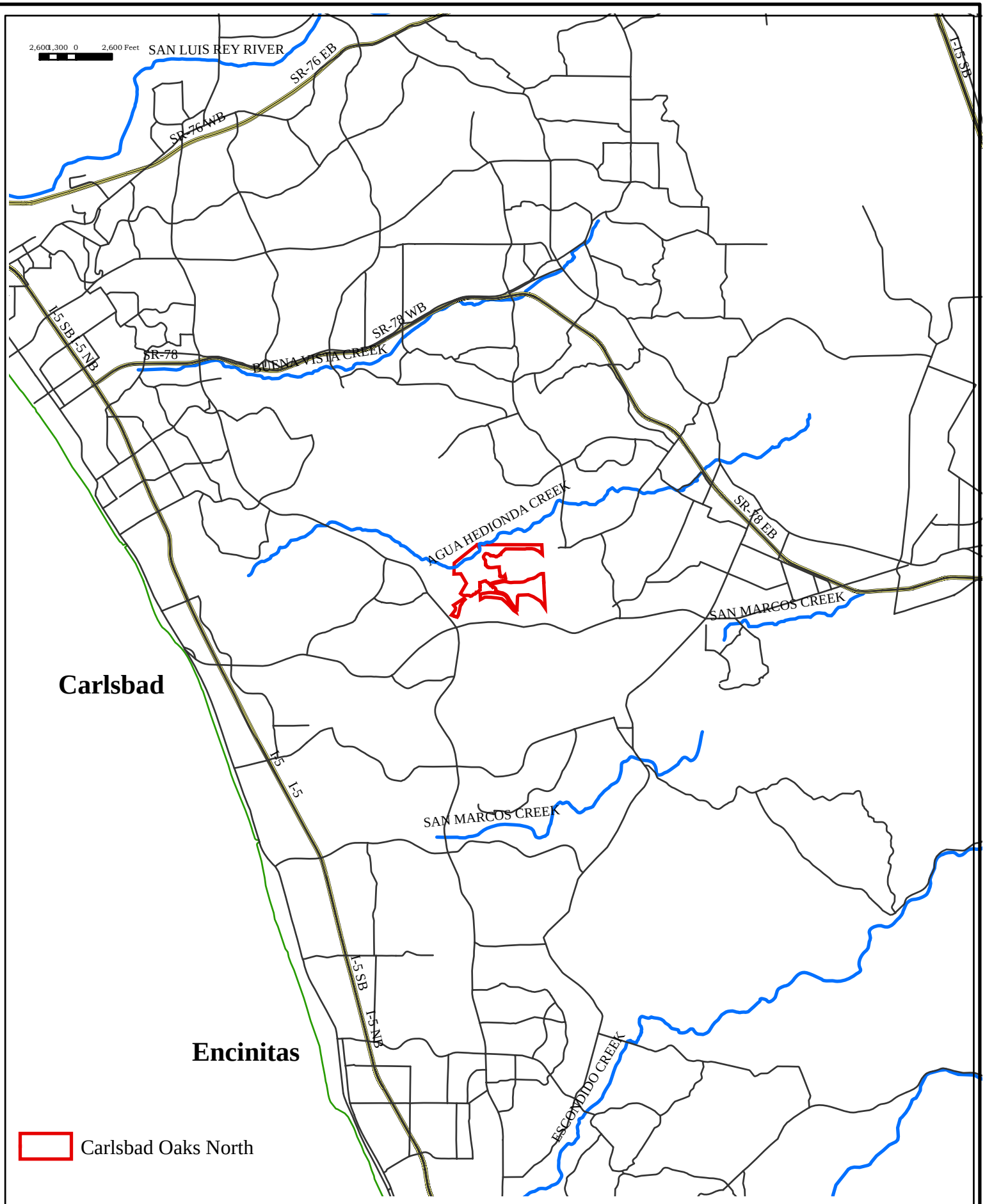

Figure 1
Preserve Vicinity
Carlsbad Oaks North Habitat Conservation Area - Carlsbad, CA

Center for Natural Lands Management

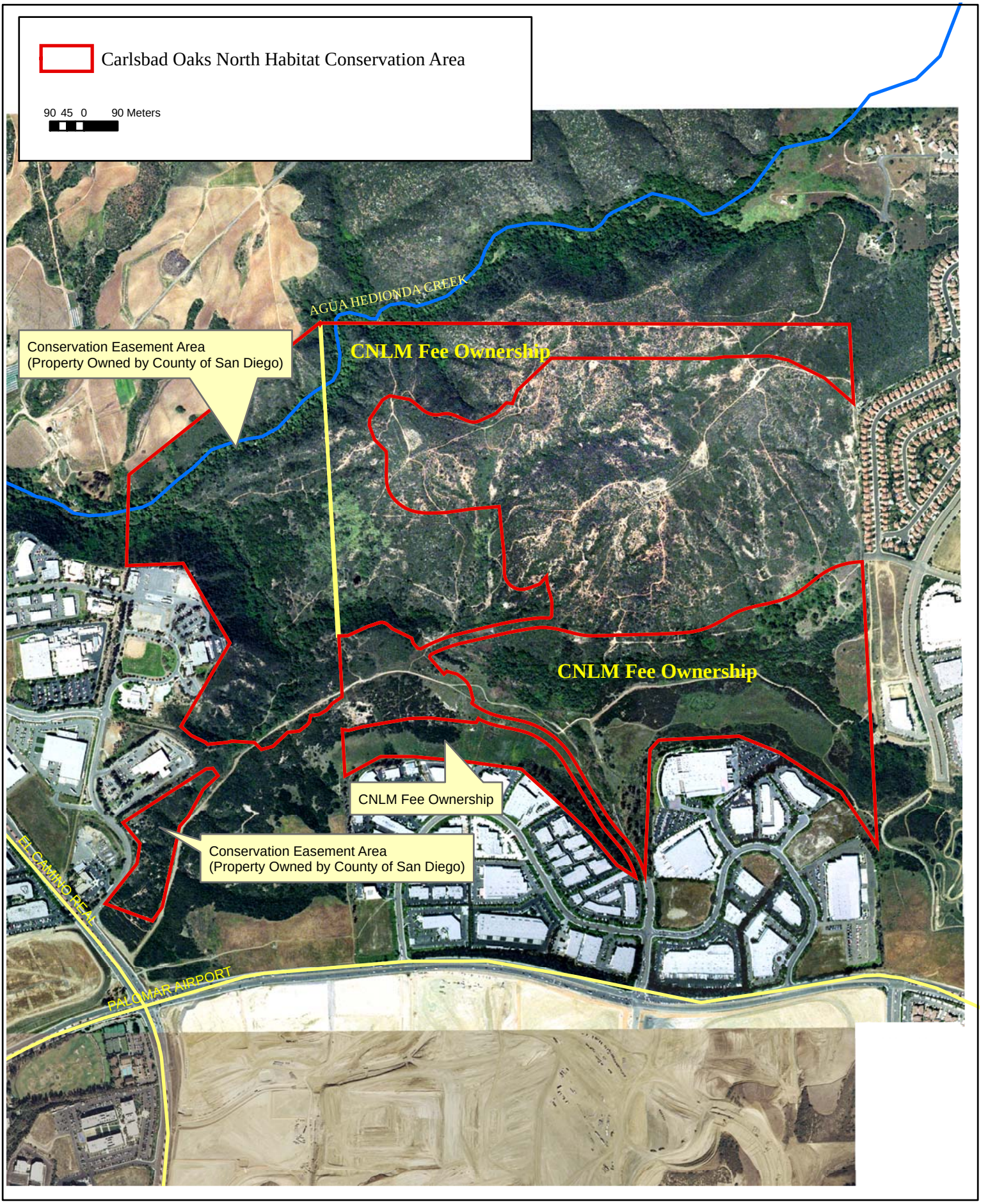

Figure 2
Preserve Location
Carlsbad Oaks North Habitat Conservation Area - Carlsbad, CA

Center for Natural Lands Management

Appendix 4
Coastal Sage Scrub Long-Term Monitoring Plan

The Center for Natural Lands Management-San Diego: Coastal Sage Scrub Monitoring Plan

Objective: Track the changes in structure and composition of the coastal sage scrub (CSS) community.

a. Use data to evaluate the structure and composition of the CSS vegetation community and its correlation to predictions of vegetation changes based on theories postulated by ecological and threats models.
b. Use data to evaluate changes or trends in "populations", presence/absence and/or occupied/unoccupied habitat of sensitive animal species, primarily the coastal California gnatcatcher (*Polioptila californica californica*)(CAGN).
c. Use data to evaluate changes in plant diversity.
d. Use data to evaluate changes over time from a baseline vegetation pattern.
e. Use data to guide vegetation management decisions (i.e. nonnative plant removal, rare species. range increases/introductions).

Background of Need:

The Center for Natural Lands Management (CNLM) manages several thousand acres of CSS in San Diego County. These areas host several threatened, endangered and sensitive plant and wildlife species, provide key locations for wildlife movement and are some of the last remaining stands of CSS in coastal San Diego. These areas were also specifically designated as important areas to conserve as part of regional Habitat Conservation Planning (HCP) conservation efforts.

As a result, the CNLM needs to be able to evaluate recruitment and vigor of this vegetation community over time to guide management decisions and to evaluate changes in plant and animal communities. This monitoring will also provide an opportunity to evaluate theorized predictions of changes in vegetation communities resulting from urbanization, nonnative species invasion, global warming, increased edge, altered fire regime and fragmentation (to name a few).

Background of Ecological Model and Threats

CSS is a fire-adapted vegetation community with fires occurring naturally, but most severely under the extreme Santa Ana heat and winds of late summer and fall and during drought conditions. During these conditions there would generally be a "complete burn" where all above ground vegetation within the fire's path would be consumed. After such a fire, herbaceous plants (fire followers), which are known to sprout after fires, would dominate the landscape for a few years. Over time (3-5 years) the shrub lands would regain their dominance, and after 5-10 years a mature assemblage of plants and wildlife would again be found on site (Dallman 1998).

The fire frequency in CSS is as frequent as chaparral due to the volatile oils and resins that occur in CSS plants. The plants, such as white sagebrush (*Saliva apiana*), are able to resprout after a fire or produce many seedlings from the dormant seed bank that lies in the soil. Seed germination of some species may also be stimulated by fire (Holland and Keil 1995, Dallman 1998). However, if the fire frequency and intensity are too great, plants in the CSS community, such as black sage (*Salvia mellifera*) and California sagebrush (*Artemisia californica*) are permanently killed and can no longer regenerate, slowly converting the CSS community to a nonnative, annual grassland (Southwest Division, Naval Facilities Engineering Command 1998).

Each CNLM preserve in San Diego has a different fire history and a different predicted fire future. For example, most of the Rancho La Costa (RLC) Habitat Conservation Area (HCA) burned in the Harmony Grove fire in October of 1996, while the Manchester HCA has not burned (except two very small fires) in its entirety since 1917. Prior to 1917 no data are recorded, so it is uncertain as to when the last significant fire event occurred in the Manchester HCA.

Regardless of fire history and the current vegetation characteristics, there are many realized or potential threats to the integrity of the CSS vegetation community (See RLC Habitat Management Plan CSS Ecological Model and Threats Section) that need to be evaluated:

1. What is the effect of the altered fire regime at each HCA?
2. What is the potential effect of global climate change?
3. What are the effects of urban edge?
4. What are the effects of fragmentation and isolation?
5. What are the effects of altered wildlife usage patterns?

These threats questions lead to other questions associated with their effect on ecological processes and patterns:

1. Are the variables investigated representing a threat?
2. At what spatial scale are the variables representing a threat?
3. How do the effects of the threats listed above effect the distribution and abundance of sensitive plant and wildlife species?
4. How do the threats listed above effect the distribution of non-sensitive plants and animals?
5. How do the effects of each threat alter ecological processes?
6. How do the various measured factors interact?

Predictions

Fire. We predict that as a result of fragmentation, complete burns of preserves are now less likely and there will be fewer, smaller fires resulting in a mosaic of CSS with various age structures.

Global Climate Change. We predict that rainfall patterns will change (likely decrease) over the next 100 years resulting in a lengthening of the fire season, frequency of lightening fires, frequency of drought, and areas burned. We predict:

1. Possible regime shifts (altered abundance and recruitment patterns in various native vegetation assemblages)
2. Altered invasion severity of exotic species due to changes from native-adapted variations in weather phenomena
3. Lowered seedling survival of species due to changes from native-adapted variations in weather phenomena
4. Lowered seed and/or clonal production of future generations due to changes from native-adapted variations in weather phenomena
5. Negative interactions between native wildlife and changes resulting from the above mentioned predictions in vegetative cover

Habitat Fragmentation and Urban Edge. We predict that habitat fragmentation will reduce plant diversity and migration and/or genetic exchange between plant populations. This could affect the CSS community by reducing vigor within populations and eventually leading to extinctions of specific plant species.. Habitat fragmentation has resulted in an increase of urban edge on all our preserves. We predict that this will result in increased pressures from nonnative plant species, illegal vegetation clearing, dumping, erosion, and other threats that will change the vegetation structure and composition.

Monitoring Methodology

Approximately fifty plots will be established inside three of our preserves, and the number per preserve allocated by the amount of acreage currently occupied by CSS in each preserve. These plots will be placed in a stratified random manner across our preserves. Stratification will take into account:

1. Size of preserve
2. Slope and aspect
3. Distance from preserve edge/urban edge
4. Presence or absence of CAGN or San Diego horned lizard (*Phrynosoma coronatum blainvillii*)
5. Fire history

Plot Design and Setup

The plot design will be of a modified Whittaker nested vegetation sampling design as in Stohlgren et al. 1995. The dimensions of the macroplot will be 50 meters long by 20 meters wide. Three smaller nested plots will be placed inside the macroplot. The larger of these three is to be 20 meters long and 5 meters wide, placed in the center of the macroplot, with the long axis corresponding to that of the macroplot. The two other nested plots will be at opposite corners of the macroplot, and will be 5 by 2 meters in length, again with the long axis corresponding to that of the macroplot. The design of the modified Whittaker plot we are using deviates from that described in Stohlgren et al.

1995 by not including the 12 smaller 1- square meter rectangles. The long axis of the modified Whittaker plots will be set to cross the environmental gradient present. Sampling will be carried out for both continuous variables (percent cover by species, perennial species height), non-parametric and semi-continuous variables (count of shrub seedlings, species presence).

Point Intercept Data

Percent cover by species will be gathered by running a point-intercept transect along one or both long borders of the macroplots. In addition to species cover, height measurements will be collected for all perennial species measured as a "hit" along the transects. The point-intercept transects will be measured at half meter intervals, thus generating 98 "hits" along one or each long side of the macroplot. Living plants will count as a point or "hit," if a 1.5 millimeter dowel is intersected in the vertical plane by the living tissue of a plant. At each half meter, data pertaining to bare ground, rock, or litter incident with the dowel will also be collected.

Species Diversity, Recruitment and Mortality

Information gathered inside the plots will include species present in each plot, including the macroplot whole plot. In the two small plots, and in the large central plot, counts of shrub seedlings by species will be documented.

Rational for a Two-Tiered Approach

The data collected in the macroplot, and smaller sub-plots will be useful in generating species area curves and (more importantly) in documenting species presence or absence, as well as recruitment and mortality over time. The advantages of using a multi-scaled approach to quantifying species richness are identified in Stohlgren et al. 1995. As the years progress, small changes in species presence or seedling recruitment may be observed as disappearances, appearances, increases, or decreases on the micro-scale of sub-plot. The appearance of nonnative species may be quickly identified on the macroplot scale, while the disappearance, or lack of recruitment among native shrubs may be apparent on the smaller plot scale prior to any notice of change on the macroplot scale. Another advantage of using smaller nested plots is that it provides an affordable estimate of shrub recruitment and mortality, since attempting to quantify these measures would be very labor-intensive if carried out on the macroplot scale.

The point-intercept transect measures will provide a method of quantifying change in abundance by species that may provide clues that tie into changes in recruitment or mortality among the sub-plot counts and diversity estimates. For instance, nonnative grasses and/or litter cover changes may be predictive as explanatory variables in a multi-factorial analysis of the response variables mortality or species number decline. Other variables that may be tied into a model explaining the measured pattern may include regional rainfall totals for the season and/or seasonal temperature averages, slope and aspect of plots, fire history, and the presence or absence of animal herbivory.

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